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Abstract

Particle density counts performed routinely in the laboratory are frequently made in duplicate. In the Poisson case the quality control of such counts may be effected by supplying the Technician with a graph paper (on the square-root × square-root scale) showing a band around the 45° line demarcating a 95% confidence belt. The graph was constructed from tables of the binomial distribution for $p = 1/2$, and the .95 probability is conditional on the sum of the duplicate counts.

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A SAD TALE

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D. S. Robson, co-conspirators

"It was a sad tale of complicated idiocy in the perpetuation of which much wit and virtue was expended." Winston Churchill.

An unbelievable amount of time is spent in the modern laboratory counting things (isotopes, worms, and cells to name a few) and there is available no simple, quality-control device to enable the researcher to check on the quality of the counts generated by his machines or technicians. As I casually passed by this problem earlier, I noticed that some distinguished scientists had technicians who were manifestly faking their data. So, in addition to emphasizing to my technicians that I wanted them always to call them as they saw them, it seemed useful to know that the technicians or machines were not unconsciously biasing the results. When I first ran into this problem in the early thirties, I did it the hard way by calculation of the deviation of replicate counts from the Poisson expectation. After the Mosteller-Tukey Binomial probability paper became available from the Codex Book Company (No. 31,298) Norwood, Mass., I began to plot dual counts against each other and measuring their deviation from a 50/50 split. This enabled one to look at populations of dual replications quite realistically. My colleague, Dr. Georgi, was quite unhappy with my sloppy procedure and persuaded Dr. Robson to show him how to set 95% confidence bounds on replicate counts from a Poisson distribution. This was done by extracting values from Documenta Geigy Wissenshaftliche Tabellen (ed. Conrad Diem, 1960). Dr. Georgi then carefully drew a large piece of graph paper with ordinate and

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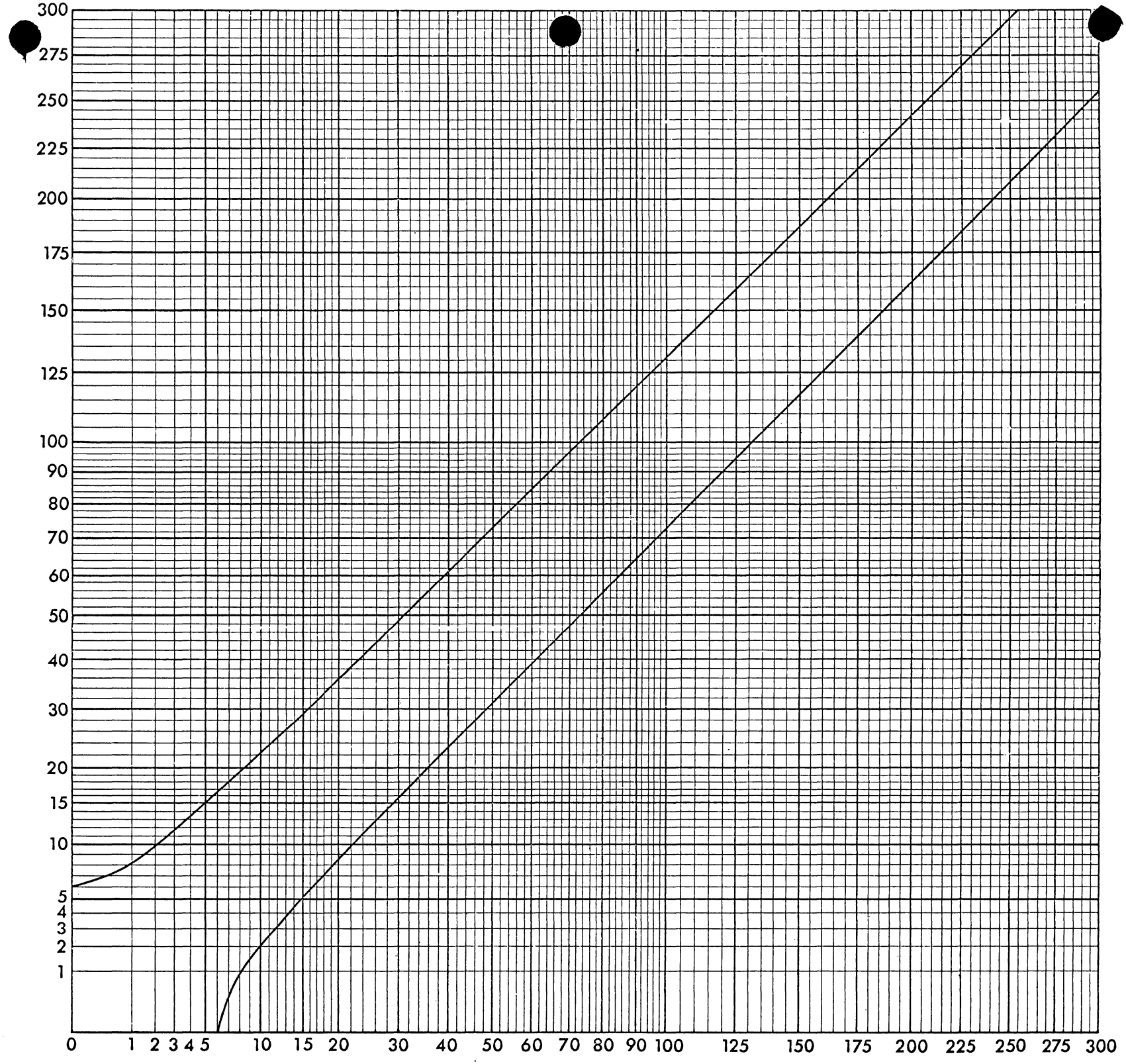
and abcissa labelled in numerical terms, but with the intervals equidistant in terms of the square roots of the numbers. He superimposed the appropriate tolerance bounds and thereby created a new count, quality-control paper. Dr. Georgi thinks that many kinds of people may wish to use this kind of paper to assay counting devices and he specifically proposes to use this graph in his new book in clinical parasitology. All of us are receiving grant funds from various federal agencies. On advice of the University Counsel, in order to prevent a copyright accidently accruing to the publisher of Dr. Georgi's book, we are filing this thesis in the libraries of Cornell.



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